XXII.—*Contributions to the Knowledge of the Alcyonaria, with Descriptions of new Species from the Indian Ocean and the Bay of Bengal.* By STUART O. RIDLEY, M.A., F.L.S., Assistant in the Zoological Department, British Museum.

OF the new species which form the chief feature of this paper two were recently obtained by a collector at Mauritius, Mr. V. de Robillard, and purchased of him by the Trustees of the British Museum, and, from their novel structural characters and remarkable size and beauty, give great promise of important results to be obtained whenever this little-known branch of the fauna of Mauritius is more fully investigated. Extraordinarily fine specimens of the beautiful *Calligorgia* (*Primnoa*) *plumatilis*, M. Edw. & Haime, and the Hydrozoan *Stylaster flabelliformis*, were obtained from the same source.

Notes are added on some of the genera of Gorgoniidæ established, mainly on external characters, by Dr. Gray; the types are in the British Museum, and have now been submitted to microscopic examination. The results appear sufficiently important to be worth recording, as many of these genera can hardly be said to be known to science, owing to the ignorance in which the descriptions leave us as to their more minute characteristics.

The measurements of spicules given below represent the *average maximum* sizes of the spicules and are inclusive of tubercles.

ALCYONINÆ, Kölliker.

NEPHTHYA, Audouin.

Nephthea, Audouin, Expl. pl. Descr. Egypte, i. p. 230.

The only described species which can be admitted in this genus, as distinguished from *Ammothea* by the large size of its cortical spicules, from *Eunephthya* by their not projecting from the surface of the cœnenchyma, and from *Spongodes* by the polype-spicules not projecting beyond the retracted polype, are :—

N. Chabrolii, Audouin (incl. *innominata*, Sav.), Expl. pl. Descr. Egypte, *l. c.* Red Sea.

N. (*Alcyonium*, Q. & G.) *aurantiaca*, Quoy & Gaimard, Voy. Astrolabe, p. 277, pl. xxii. figs. 16–18. New Zealand.

N. coccinea, Stimpson, Proc. Acad. Philadelphia, vii. p. 375. China.

N. aurantiaca, Verrill, Proc. Ess. Inst. iv. p. 191. China Sea, 23° N. lat.

N. nigra, Pourtalès, Bull. Mus. Comp. Zool. i. p. 130. Sand Key, Florida.

Other species have been assigned to it, but transferred to other genera (e. g. *Eunephthya*, Verrill, *op. cit.* vi. p. 80, and *Spongodes*, Klunzinger, Kor. Roth. Meer. p. 38).

A new species is now added :—

Nephthya burmaensis, n. sp.

Base spreading, lamellar, coriaceous; vertical portion consisting of short (the "primary") lobes, about 10 millim. in diameter, which themselves divide almost immediately into the ultimate polype-bearing lobules (or secondary lobes), which are slender, viz. only about 3 millim. in diameter, and so numerous as to conceal most of the lobes and the common base. A few single polypes are also borne directly on the primary lobes. The lobules or secondary lobes are thickly covered with the large polype-cells, whose bases occupy almost the whole of the surface of the lobule. The polype-cells project outwards almost at right angles to the lobule, with a slight upward direction; they are prominent cylindrical bodies, measuring 2·5 millim. in length by 1·25 millim. in diameter, and terminate (in the closed condition) in a rounded end, on which the eight segments of the contained polype are indicated by the presence of eight distinct pairs of smallish spicules, whose distal points form a circle round the orifice of invagination, the spicules themselves lying in the direction of the long axis of the polype.

The two spicules forming each of these terminal pairs are generally parallel and in close juxtaposition with each other, but sometimes diverge proximally, forming a V. A collar of closely appressed spicules lies at the base of this crown, the long axes of the spicules being at right angles to those of the latter. The succeeding spicules as far as the base are irregularly arranged, with distinct gaps between them, more or less across the long axis of the lobes or lobules; those of the base are closely aggregated and mostly parallel to each other. Spicules white in spirit, of one type throughout, viz. curved, fusiform, pointed at ends, thickly covered with prominent blunt tubercles, themselves covered with small tubercles; the tubercles sometimes approach a verticillate arrangement in the larger spicules. The spicules (i.) of the crown are elongated and somewhat sharply pointed, those (ii.) of the base rather thick in the middle, tapering rapidly to the rather sharp point; those (iii.) of the intermediate area are long, blunter, and more uniform in diameter throughout the spicule. Size of spicules (i.) of crown about 1 by ·1 millim., (ii.) of base ·5 by ·1 to 1·4 by ·28 millim., (iii.) the largest of intermediate area 2 by ·2 millim.; but there is a gradation in size from the intermediate area to the crown on the one hand, and to the base on the other.

Colour of soft parts very pale flesh-colour.

Hab. British Burmah (coll. Mus. Brit.).

Examined. In spirit.

Obs. The species is represented by a small colony of three primary lobes rising from the common base, which clasps a small calcareous mass; maximum height 25 millim., maximum width 45 millim. It was presented to the national collection by W. Theobald, Esq., in company with some Crustacea.

From all the species assigned above to the genus either the pale colour of the soft parts or the whiteness of the spicules distinguishes it; *N. Chabrolii*, which seems to have the dull general coloration, differs in its very large polypes and their green spicules. *N. niger* is, of course, black; and if the "costæ" assigned to it are ridges resembling the costæ of Madreporaria, they constitute another point of difference; but I am not sure what is intended by the term.

MORCHELLANA, Gray.

Morchellana, Gray, P. Z. S. 1862, p. 30.

Having examined the type specimen of the species on which this genus is based (viz. *M. spinulosa*, Gray, *l. c.*, figured), I cannot see sufficient reason for its generic distinction from *Spongodes*, with which it agrees in having a large spicule projecting longitudinally at the side of the polype-cell. The wall of the stem is thin, and contains small fusiform spicules. The brittleness mentioned by Dr. Gray appears to be due to the impregnation of the specimen by salt previous to its immersion in spirit and the perhaps consequent alteration of the consistency of the spicules, which shows itself in their unusual brittleness and opacity. The same fact accounts in part for the infrequency with which the projection of the polype-spicule can be made out, owing to its fracture in many cases.

Primnoaceæ.

VILLOGORGIA, Duchassaing de Fonbressin & Michelotti.

Villogorgia, Duch. de Fonbressin & Michelotti, Mém. Cor. Antilles, p. 32.
Paramuricea, Kölliker (pars), Icones Histiol. p. 136; Studer, MB. Ak. Berlin, 1878, p. 653.
Lissogorgia, Verrill, Proc. Bost. Soc. 1864, p. 213.
?*Blepharogorgia*, Duch. & Mich. Rev. Spong. Zooph. Antilles, p. 15.
Boarella, Gray, Ann. & Mag. Nat. Hist. (4) v. p. 406.
Brandella, Gray, Cat. Lithophytes Brit. Mus. p. 30.
Plexaura, pars, Klunzinger, Kor. Roth. Meer. p. 52.

Type *Villogorgia nigrescens*, Duch. & Mich. *l. c.*

No good reason seems to exist why Kölliker, writing in 1864, should have replaced the name given in 1860 to this genus by the authors of the 'Mémoire sur les Coralliaires des Antilles' by a fresh appellation, still less for Dr. Gray's action in 1870 in ignoring the work of all three writers. But Kölliker's name may be with advantage retained for a part of his genus.

It may be defined as consisting of Gorgoniidæ with well-branched corallum, with entirely horny axis, scarcely or not at all concealed, except on ultimate branches, by a thin cœnenchyma; covered on all sides by scattered verrucæ; more or less anastomosis of the branches occurs. Verrucæ prominent, cylindrical, surrounded or not by a crown of projecting linear spicules. Spicules of cœnenchyma large, tuberculate, 4–8-stellate, and fusiform; those of verrucæ large, tuberculate, fusiform, accompanied by flattened, superficially tuberculate, and laterally scalloped forms ("Stachelplatten," Kölliker, Icon. Histiol. pl. xvii. fig. 19 *a*, &c.). The genus thus limited would probably include *Paramuricea placomus*, Esper (Köll.), *P. spinosa*, Kölliker (*l. c.*), *P.* (*Villogorgia*) *nigrescens*, Duch. & Mich. (*l. c.*), *P. gracilis*, Studer (*l. c.*), *P. borealis*, Verrill (Am. J. Sci. [3] xvi. p. 213), *Gorgonia cancellata*, Dana, = *Antipathes flabellum*, Pallas, *Brandella intricata*, Gray (*l. c.*), *Lissogorgia flexuosa*, Verrill (Proc. Essex Inst. iv. pp. 43, 187), and perhaps *Antipathes clathrata* and *A. fœniculata*, Esper.

For species without the Stachelplatten of the cortex *Paramuricea* might be retained as a subgenus, although in external characters it cannot be distinguished from typical forms of *Villogorgia*; and the peculiar spicule of that genus is, as Kölliker believes, probably represented by the quadri- and octoradiates of this group. Into this division would fall *Paramuricea intermedia*, Kölliker (*l. c.*), *Boarella flabellata*, Gray (Ann. &

Mag. Nat. Hist. [4] v. p. 406), and a new species, *P. mauritiensis*, described below. It is possible that some of the species referred above to the typical group, *Villogorgia*, s. str., but whose minute characters are imperfectly known, may prove to belong to this division (e. g. *Antipathes flabellum*, Pallas).

Echinogorgia, Kölliker (*l. c.*), appears to be distinguished from *Villogorgia* by the thickness of the cortex, which hides the axis, and by its commonly bright or pale colour.

Villogorgia intricata.

Brandella intricata, Gray, Cat. Lithophytes Brit. Mus. p. 30.

This species (the typical and only species of the genus to which Dr. Gray assigned it) was very shortly described, with, however, a fairly characteristic woodcut of some terminal branches. The type specimens, which are merely the peripheral portions of what was probably a single colony, are in the British Museum; and from them I have obtained details as to the characters of the spicules which justify the course I have taken in suppressing its genus and attaching it to *Villogorgia.*

Spicules of cortex, (i.) fusiform, with rounded ends, covered with numerous inconspicuous rounded tubercles, with two or three rounded projections from the centre at one side, size ·28 by ·044 millim.; or they may have two lateral projections, longer and on opposite sides, and measure ·25 by ·035 millim., thus forming a transition to the well-marked quadriradiate form (ii.), which has four cylindrical radii, the two pairs of radii being usually inclined at an obtuse angle to each other, well tuberculated, with distinct and prominent but small tubercles, size ·18 by ·035 millim. (iii.) Flattened, disk-like, tapering into two or more terminal points, the margin more or less scalloped into teeth, and the surface slightly embossed with low tubercles; a few small fenestræ penetrate the disk; size ·34 by ·18 millim. Polype-spicules (iv.) fusiform, similar to (i.), or with a central zone of long tubercles, size ·35 by ·108 to ·37 by ·071 millim. (v.) Disk-like forms of similar characters and size to those of the general cortex (perhaps really belonging to it).

In external characters it is hardly distinguishable from *V. mauritiensis* (q. v. infrà).

Hab. Dewi(?) Reef, Bass's Strait.

Villogorgia (*Paramuricea*) *flabellata.*

Boarella flabellata, Gray, Ann. & Mag. Nat. Hist. ser. 4, vol. v. p. 406.

Having examined the typical specimen of this species, I am able to say that it is a true *Villogorgia* of the *Paramuricea* division. The mouths of the verrucæ have the normal number of eight valves, not ten, as stated by Gray; and they are terminated by sharp, distinctly projecting fusiform spicules. The verrucæ are not confined, as a rule, to the lateral margins, as stated by the same author, but, as in other *Paramuriceæ*, distributed over all parts of the surface of the branches. In general appearance it much resembles *V. mauritiensis.* The fusiform cortical spicules (i.) are sharply pointed, have a few angular sharp tubercles, and resemble those of *Echinogorgia intermedia*, Studer; size ·32 by ·035 millim. The stellates of the cortex (ii.) have long slender and rather irregular and curved arms, from four to five in number, the fifth in a different plane from the rest; the body is usually rather elongate; a few medium-sized tubercles on body and arms; maximum length ·212, thickness of body ·035, of arms at base ·026 millim. The spicules of the verrucæ are either (iii.) elongate fusiform, exactly like (i.), but measuring ·46 by ·035 millim., or (iv.) coarser fusiform, with one part bent at a considerable angle to the rest of the spicule, sharply pointed and tuberculate after the same manner as (i.), size ·355 by ·071 millim. Colour greyish brown, except near base, where the black colour of the axis appears through the cortex.

Hab. Unknown.

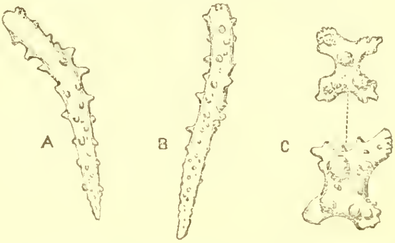
Obs. The genus *Boarella* lapses altogether, since *B. flabellata* is the type and the only species belonging to it.

Villogorgia mauritiensis, sp. n. (Fig. 1.)

Corallum branching frequently in one plane; branches subdichotomous, showing tendency to be suppressed on the inner aspect, given off at intervals of from 7 to 28 millim. as a rule; angle of branching varying from about 30° in the case of the larger, to from 45° to 80° in the terminal branches. Stem and main branches slender in proportion to size of corallum; terminal branches filiform, viz. ·4 millim. in diameter excluding the verrucæ; anastomosis frequent in central parts, forming elongate meshes, uncommon near periphery. Axis of main branches strongly compressed laterally, the antero-posterior diameter being about twice that of the lateral diameter. Substance of axis black, glabrous, tough and elastic, and light, except in the ultimate twigs, where it is brown. Cortex very slight, forming a brownish film on the main branches, but not concealing the axis, becoming slightly thicker, viz. about ·07 millim., towards the periphery. Verrucæ distributed over all parts of the branches, not leaving any posterior bare space; more thickly towards the terminations of the twigs, where they are almost or quite in contact at their bases; distribution approximately alternate; prominent, cylindrical, blunt; length of verrucæ of terminal twigs ·7 to ·75 millim., breadth ·75 millim., those of the larger branches somewhat smaller.

Spicules of general cortex:—(i.) fig. 1, A, linear, the shaft cylindrical, tapering more or less towards one end, the thicker two thirds bearing scattered, rather distant, prominent verruciform tubercles, roughened at their free ends, size ·35 by ·053 millim.; (ii.) fig. 1, C, quadriradiate stellates, generally with a somewhat elongate body, almost smooth, from which two pairs of radii are given off in one plane at an angle of from 90° to 135° with one another, and two pairs of similar tubercles on opposite sides of the body, in a plane at right angles to that of the other two pairs, the radii blunt or subacute, bearing some large rough tubercles, or with the body developed at the expense of the rays, which then form merely lateral angles of a short barrel- or capstan-shaped shaft; size ·14 by ·035 millim. Spicules of verrucæ of one kind only, viz. (iii.) fig. 1, B, the same as no. i., but rather longer and with more numerous tubercles, size ·39 by ·053 millim. Colour, dirty black on main branches, wainscot-brown on terminal branches.

Fig. 1.—*Villogorgia mauritiensis.*



A. Fusiform spicule of cortex, × 90 diam. B. Fusiform spicule of verrucæ, × 90 diam. C. Different forms of octoradiate spicule of cortex, × 100 diam.

Hab. Mauritius, 80 fathoms (coll. Mus. Brit.).

Obs. The single specimen which represents this species was recently obtained from Mr. V. de Robillard in the dry condition. It is of remarkable size, viz. height 32 inches (800 millim.), maximum breadth 18½ inches (462 millim.); the antero-posterior diameter of the first main branch is 7 millim., the lateral diameter 3 to 5 millim. It has an irregular thin base of parchment-like substance, covering a bivalve shell &c.

Its peripheral portions strongly resemble the type specimen of *V.* (*Brandella*) *intricata*, Gray, in general appearance, but differ in the rarity with which anastomosis occurs in this part of the corallum and in the broader shape of the meshes of the reticulation. It differs in spiculation from that species chiefly in not possessing the flattened tuberculate disks of the cortex; it differs from *V.* (*Paramuricea*) *intermedia* in the inferior proportions of its spicules, and from *V.* (*Plexaura*) *torta* in the much larger size of these parts, and in the more pointed and less strongly tuberculate character of the fusiform spicules. As stated above, the species falls into the *Paramuricea* section of the genus *Villogorgia*.

It is not impossible that specimens of this species may have been included by Studer (MB. Ak. Berlin, 1878, p. 653) under *Paramuricea cancellata*, Verrill, as he describes specimens from the Indian Ocean having a well-marked lateral compression of the branches.

The known species of the subgenus may be thus tabulated:—

	Length of cortical spicules.	Length of polype-spicules.	Colour.	Locality.
	millim.	millim.		
Villogorgia (Paramuricea) intermedia, *Kölliker*.	·18–·55	·4–·62	?	Hab. ?
Villogorgia (Plexaura) torta, *Klunzinger*.	·032–·086	·016–·048	Black.	East of Red Sea.
Villogorgia mauritiensis, sp. n.	·14–·35	·39	Dirty black to brown.	Mauritius.
Villogorgia (Boarella) flabellata, *Gray*.	·21–·32	·35–·46	Greyish brown.	Hab. ?

MENACELLA, Gray.

Menacella reticularis, Gray.

This, the type species of the genus *Menacella*, founded by Dr. Gray in 1870 (Ann. & Mag. Nat. Hist. ser. 4, vol. v. p. 406), is nominally based on *Gorgonia reticulum* (not *reticularis*, as erroneously printed), Pallas. It strongly resembles species of *Villogorgia* in external characters—that is to say, the type specimen, as labelled by Dr. Gray, in the British Museum; but it is necessary to point out that this is not in reality referable to Pallas's species, which is described by that author as red in colour or "pallida," and as "inter

Gorgonias omnes ponderosissima," whereas this species could hardly be of a less specific gravity, and is coloured grey or dirty white. The species must therefore be cited as *Menacella reticularis*, Gray, nec *reticulum*, Pallas.

In its spiculation it differs very decidedly from the members of the genus *Villogorgia* in having none but simple tuberculate fusiform spicules, with strongly microtuberculate or exfoliating tubercles; the spicules are black in colour, with the exception of the tubercles, which are colourless; the largest measure ·5 by ·101 millim.

GORGONELLACEÆ, Valenciennes.

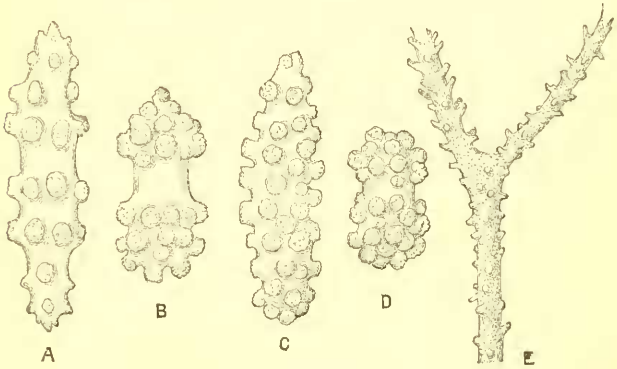
VERRUCELLA, Kölliker (nec M. Edw. & Haime).

Juncella, Klunzinger, pars.

Verrucella candida, n. sp. (Fig. 2.)

Corallum branching dichotomously in various planes; branches few and long and at considerable intervals; the terminal branches, where normally developed, from 3 to 15 inches long (75 to 375 millim.); branches given off at angles of 45° to 90°.

Fig. 2.—*Verrucella candida.*



A. Fusiform whorled spicule of verrucæ, × 290 diam. B and D. Different forms of double-headed spicule of cortex, × 240 diam. C. Cylindrical spicule of verrucæ, × 300 diam. E. Part of corallum, including the third bifurcation from the base, nat. size.

Stem and larger branches cylindrical, the stem 6 millim. thick, the branches decreasing but slightly in diameter towards the periphery of the colony, where they are 2 millim. in long diameter (exclusive of verrucæ), being flattened at this point.

Cortex compact, from ·5 millim. thick on stem, to ·25 millim. on apical portions of branches; surface minutely ridged longitudinally; no longitudinal grooves. Verrucæ prominent, 1 to 2 millim. apart, truncate-conical, 2 millim. long by ·75 millim. in apical diameter, flexible, and apt to become flattened at their external halves; equally distributed over stem and lower parts of branches, but towards free ends becoming almost confined to the lateral surfaces. Axis hard, smooth.

Spicules of cortex of one kind, viz. (i.) double-headed forms with very narrow bare median space, the heads being covered with about three series each of small smooth rounded tubercles; size ·106 by ·062 millim. Spicules of verrucæ of two kinds, viz.:— (ii.) cylindrical, rather blunt, tuberculate, with numerous small rounded tubercles irregularly scattered all over, size ·123 by ·044 millim.; (iii.) fusiform, pointed at ends, with slight median bare space, and on each side of this about four whorls of tubercles like those of nos. i. and ii.; size ·142 by ·044 millim. Colour pure white, that of axis yellowish brown.

Hab. Mauritius, 90 fathoms (coll. Brit. Mus.).

The very fine and perfect single specimen was collected by Mr. V. de Robillard at Mauritius; it is 20 inches (500 millim.) in maximum height, 15 inches (375 millim.) in maximum lateral expansion of branches.

Obs. The very long verrucæ appear to distinguish this from all, and the peculiar mode of branching from most, *Verrucellæ*; in the latter point it resembles *V. granifera*, Kölliker (Icon. Histiol. p. 140, pl. xix. fig. 4), the spicule figured by that author being of similar character to, though more pointed than, no. ii., described above; but the verrucæ of that species are described as but slightly prominent and the cœnenchyma as yellowish brown; it is recorded as from the coast of Africa. I do not feel sure what ought to be the name of the genus; Kölliker seems to have based his genus on the later rather than the earlier species of Milne-Edwards and Haime's genus.

XXIII.—*Note on a Freshwater Macrurous Crustacean from Japan* (Atyephyra? compressa, *De Haan?*). By Edward J. Miers, F.L.S., F.Z.S.

The specimens which are the subject of this note were sent to the British Museum by my friend Dr. P. Mayer, of Naples, with the request that I should determine the species. They